

Feasibility Analysis of Translocating Western Pearlshell Mussels into the Cherry Creek Native Trout Project Reach on the Flying D Ranch of Montana

A Report to Turner Enterprises, Inc.

by
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Introduction

The western pearlshell mussel (WEPE), *Margaritifera falcata* has experienced significant range reductions across Montana in the last 100 years and is now known from ~88 populations, of which, only ~20 are expected to be viable 100 years from now (Stagliano 2010). Many of these remaining populations are also at risk of extirpation due to stochastic events capable of wiping out these isolated small populations, and from lack of reproduction with non-native salmonid host species. Cherry Creek below the natural canyon barrier on the Flying D Ranch is one such stream that currently has a non-viable population (D-rank, Stagliano unpublished data 2010), and closer to the confluence with the Madison River, mussels remain sparse and non-viable (Stagliano 2008, unpublished data). The declining status of the WEPE has led to its designation as a Tier 1 Species of Conservation Need (SGCN) by MT Fish Wildlife and Parks (2006), a Species of Concern by the State of Montana (MTNHP 2008) and a Sensitive Species by the U.S. Forest Service Northern Region 1 (2011, S. Spaulding pers. comm.).

The best approach to conserving aquatic species is to ensure that habitats are managed in ways that maintain healthy ecosystems and allow the full complement of native species to flourish. Turner Enterprises has come a long way to achieve this goal on the Flying D Ranch with the restoration of Cherry Creek to a native westslope cutthroat trout stream. To fully succeed in the goal of harboring all native aquatic species, the western pearlshell mussel, found naturally below the natural barrier but prefers the westslope cutthroat trout as its native host fish, needs to be included in the Cherry Creek restoration plan.

Objectives. This project will: 1) evaluate the feasibility of translocating the WEPE into Cherry Creek above the natural fish barrier on the Flying D Ranch by evaluating habitat suitability throughout the ~10 mile reach of Cherry Creek in the context of stream habitat parameters known to contain populations of WEPE in Montana, 2) Measure and identify stream geomorphology parameters known to be favored by WEPE including stable stream reaches with point bars, willow/alder dominated riparian, minimal bedload movement and a Rosgen C3-C4 stream classification (i.e. gradient <2%, >1.2 sinuosity, >12 width/depth ratio, avg. substrate size 32-45mm) (Rosgen 1996), 3) Identify a suitable donor population in the Madison River

watershed and have 30 specimens from that population tested by the FWP Fish Health Committee (following MTFWP 2010 protocols). If all objectives are met, we would be positioned to begin translocations in 2013 given positive habitat feasibility ranks and a certified disease-free, donor population.

Methods. We used widely accepted Rosgen Level II methodology to evaluate, quantitatively measure and analyze stream geomorphology on Flying D Ranch Cherry Creek sections (Rosgen 1996). Parameters such as channel gradient and stability, point bar formation and sinuosity were measured by walking the reach at the high water mark and stretching a chain-man line as a distance measure, while a straight line measure was calculated from GPS readings taken at the top and bottom of the reach using a Garmin 60 CSX; the ratio of chain-man distance to straight line measures is the calculated sinuosity. Gradient was calculated with the laser level and stadium rod as the difference between stadium height reading at the wetted edge of the laser location minus the stage height reading at a distance of at least 20x wetted widths downstream divided by that reach distance. Channel cross sectional data was measured using a laser level at the crest of the riffles where the pebble count (100 particles counted) was performed. This data was entered on standardized Laser Level Channel Cross-Section, Pebble Count and Stream Classification forms to provide the necessary variables to assign a Rosgen Stream Classification. We then ranked suitability for WEPE translocation based on the stream classification, with reaches classified as C4 ranking highest.

We also searched database records for previous mussel surveys in the Madison River basin and performed additional mussel surveys on streams that had few to no survey records in the basin. We used visual encounter surveys standardized for the statewide mussel surveys protocols (Stagliano 2010).

Results

We performed Rosgen Level II evaluations on ten Cherry Creek stream reach sections, seven above the natural barrier in the Butler Reach and three above the man-made barrier (Table 1, Map 1 and 2). Stream reach sites behind and upstream of the ranch house (sites #825-828) and

just upstream of the natural barrier canyon (site #832) have limited potential as WEPE translocation sites due to the higher gradient and larger substrate classes (Rosgen B3) as indicated in their pebble counts (Table 1, Appendix A). The most suitable WEPE translocation sites are within the Butler Reach (4 sites) and one reach above the man-made barrier (#823) (Table 2, Map 1 & 2).

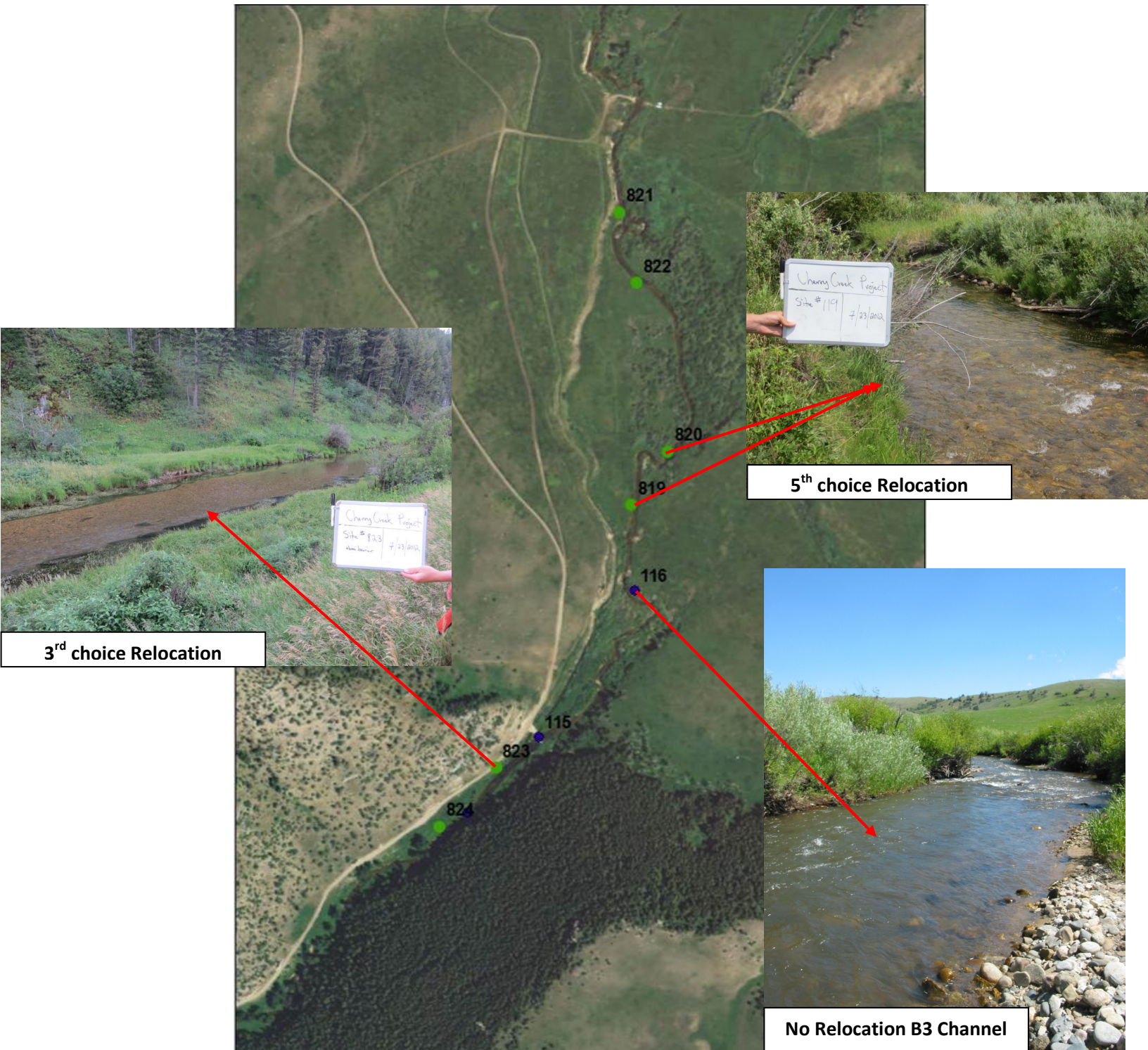
Table 1. Rosgen II field measurements used in stream classification. Highest ranking preferred WEPE habitat site are bolded and shaded.

<i>Site ID</i>	<i>Bankfull Channel Width (m)</i>	<i>Entrenchment Ratio</i>	<i>Width / Depth Ratio</i>	<i>Estimated Sinuosity</i>	<i>Stream Slope (%)</i>	<i>Riffle Pebble Count D50</i>	<i>Rosgen Stream Type</i>	<i>Suitability Rank</i>
116	6.7	2.1	24.0	1.20	1.9	90-128	B3/C3b	5 th 5 th 4 th
119	6.9	2.8	25.4	1.67	0.9	45-64	C4b	
819	7.0	2.2	26.0	1.50	1.1	64-90	C3b	
821	9.7	2.5	31.5	1.90	0.6	64-90	C3	
823	11.4	2.3	34.0	1.14	0.5	32-45	C4	3rd
825	6.6	2.2	20.1	1.20	1.7	90-128	B3/C3b	
826	na	na	na	na	na	na	na	
827	10.1	8.0	32.2	1.20	1.5	90-128	C3	
829	8.8	2.1	22.0	1.20	1.8	90-128	B3/C3b	
830	10.1	4.1	18.7	1.35	0.8	64-90	C4/C3	2nd
831	10.1	4.1	18.7	1.35	0.8	64-90	C4/C3	2nd
832	9.5	1.8	14.0	1.10	2.1	90-128	B3	
833	10.2	2.9	29.0	1.24	0.7	45-64	C4	1st
834	10.2	2.9	29.0	1.24	0.7	45-64	C4	1st

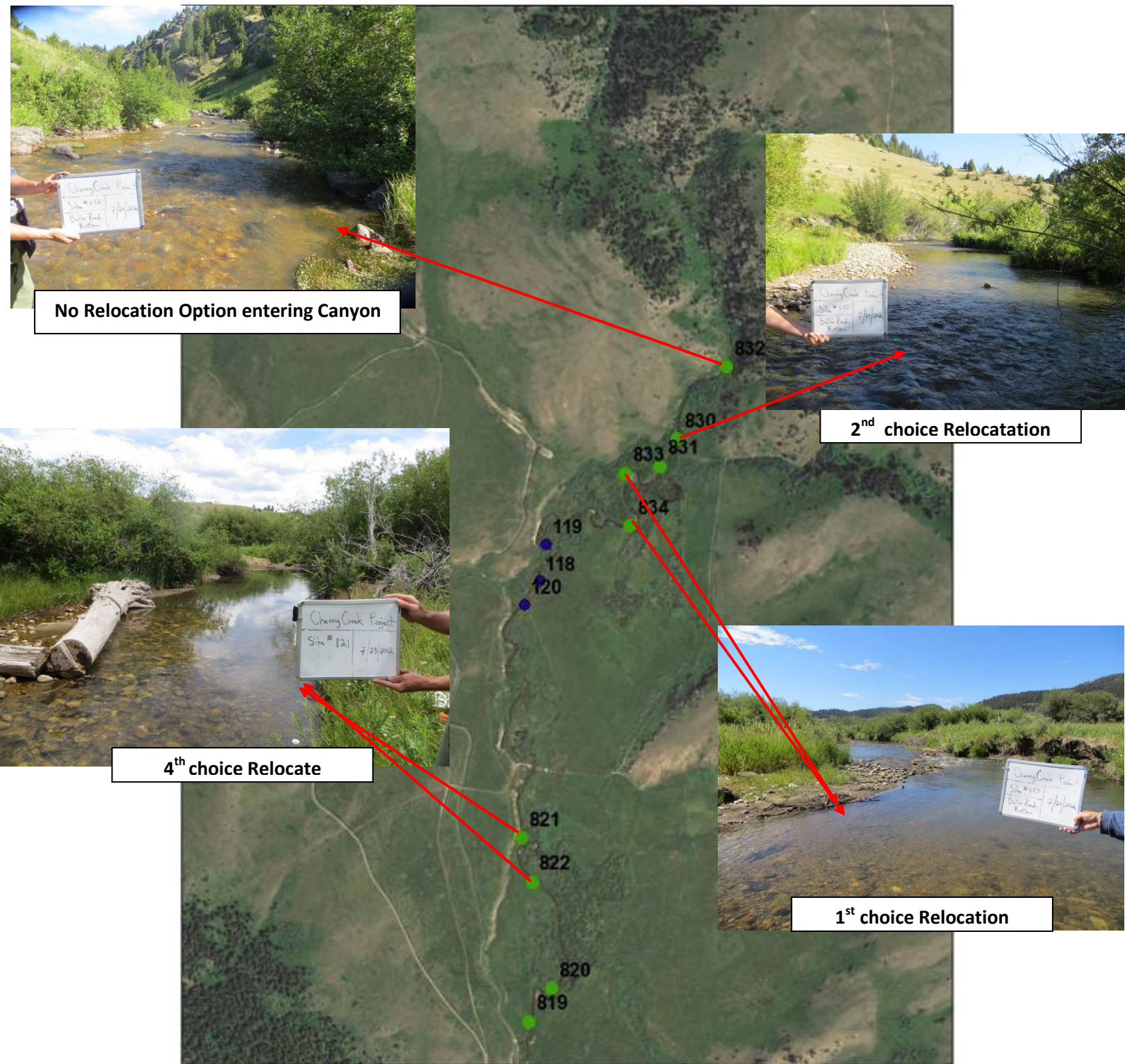
Table 2. Cherry Creek and Spanish Creek sites visited during the TEI Ranch Surveys 2012. Stream sites are organized from higher elevation --> downstream. Shaded sites are those ranked most suitable for WEPE translocations. TDS = Total Dissolved Solids

Site Number	Site Code	latitude	longitude	Date/time	Elevation (m)	Rosgen Class	Site Description	Temp °C	Cond (µs/sec)	pH	TDS	Photo Link
829	UM_CC829	45.5157	-111.4478	7/24/2012 7:37	1742	B3/C3	Cherry Creek above the ranch reach, boulders with some embedded cobbles trapping sand	12.1	37	7.8	18	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC829.JPG
827	UM_CC827	45.5188	-111.4453	7/24/2012 7:21	1735	C3	Cherry Creek above the active beaver pond, B3/C3 Rosgen reach boulder dominated	12.2	39	7.7	19	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC827.JPG
826	UM_CC826	45.5222	-111.4478	7/24/2012 7:12	1731	na	Cherry Creek behind the cow camp with an active beaver pond	12.7	38	7.7	20	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC826_bp.JPG
825	UM_CC825	45.5226	-111.4459	7/24/2012 7:09	1706	B3/C3b	Cherry Creek behind the cow camp	12.3	37	7.7	19	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC825.JPG
823	UM_CC823	45.5508	-111.4466	7/23/2012 19:30	1674	C4	Cherry Creek above the man-made barrier	11.7	126	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC823_ov.JPG
116	UM_CC116	45.5512	-111.4460	7/23/2012 14:02	1672	B3/C3b	Cherry Creek upstream of site 819 at upper end of Bulter Reach	12.5	122	8.1	60	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC116.JPG
819	UM_CC819	45.5542	-111.4443	7/23/2012 12:54	1671	C3b	Cherry Creek on the Turner Ranch upper end of Butler Reach	12.5	124	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC821_t.JPG
821	UM_CC821	45.5579	-111.4446	7/23/2012 14:54	1670	C3	Cherry Creek on the Turner Ranch upper end of Butler Reach	12.9	129	8.2	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC821.JPG
119	UM_CC119	45.5630	-111.4444	7/23/2012 13:54	1668	C3b	Cherry Creek upstream of site 833 at lower end of Bulter Reach	11.7	124	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC119.JPG
833	UM_CC833	45.5652	-111.4419	7/24/2012 10:53	1665	C3/C4	Cherry Creek in the Butler meadow reach transistioning from a C3 to a C4	12.2	119	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC833.JPG
834	UM_CC834	45.5642	-111.4417	7/24/2012 11:06	1664	C4	Cherry Creek in the Butler meadow reach, great WEPE habitat	12.2	119	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC833_u.JPG
830	UM_CC830	45.5659	-111.4405	7/24/2012 9:22	1663	C3/C4	Cherry Creek in the lower butler meadow reach transistioning from a C3 to a B3	11.5	115	8.2	57	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC830.JPG
831	UM_CC831	45.5654	-111.4409	7/24/2012 9:28	1662	C3/C4	Cherry Creek in the lower butler meadow reach transistioning from a C3 to a B3	11.5	115	8.2	57	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC831.JPG
832	UM_CC832	45.5674	-111.4391	7/24/2012 10:31	1660	B3	Cherry Creek exiting the Butler reach transistioning from a C3 to a B3	12.2	119	8.1	62	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC832.JPG
835	UM_CC835	45.5947	-111.4907	7/24/2012 12:13	1388	C3	Cherry Creek below the natural barrier transistioning from a C3 to a B3	15.6	141	8.5	70	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC835.JPG
836	UM_CC836	45.5938	-111.4890	7/24/2012 12:33	1386	B3	Cherry Creek below the natural barrier transistioning from a C3 to a B3	15.6	141	8.5	70	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC836_d.JPG
816	UM_CC816	45.6172	-111.5432	7/23/2012 10:13	1363	C4	Cherry Creek below the county road bridge off Ranch	17.8	165	8.0	82	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_CC816.JPG
837	UM_SPC837	45.4930	-111.3676	7/24/2012 14:10	1722	B3	Spanish Creek on the TEI Property	16.3	43	7.9	22	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_SPC837.JPG
838	UM_SPC838	45.4986	-111.3240	7/24/2012 14:30	1668	C3	Spanish Creek on the TEI Property	16.5	44	7.9	24	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_SPC838.JPG
839	UM_SPC839	45.4976	-111.3251	7/24/2012 14:43	1665	C3	Spanish Creek on the TEI Property	16.5	44	7.9	22	http://mtnhp.org/ThumbsPlus/Eco/Aquatics/MusselSurveys/UM_SPC839.JPG

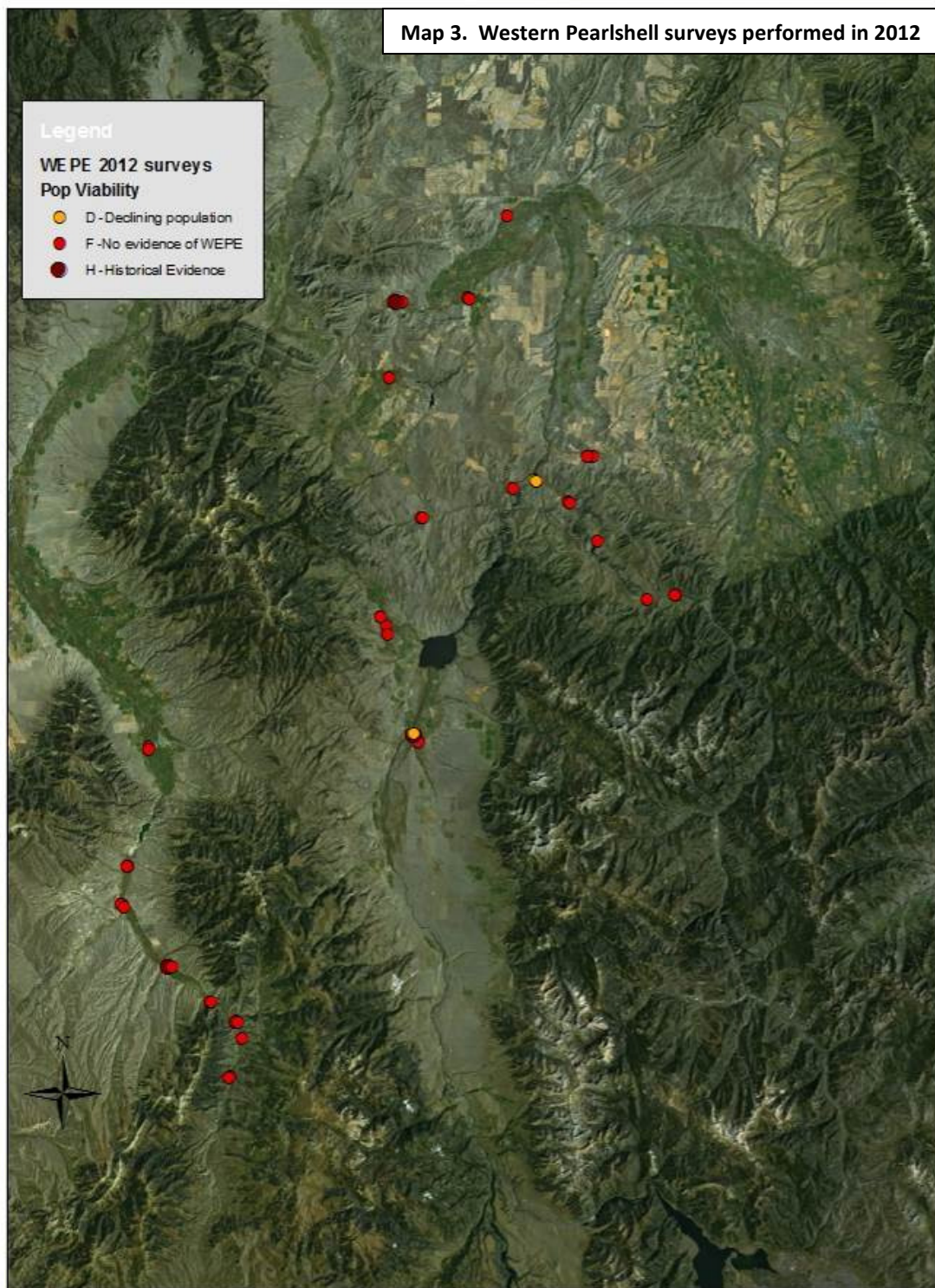
Map 1. Cherry Creek on TEI Property from manmade barrier (site 115) downstream into Butler Reach



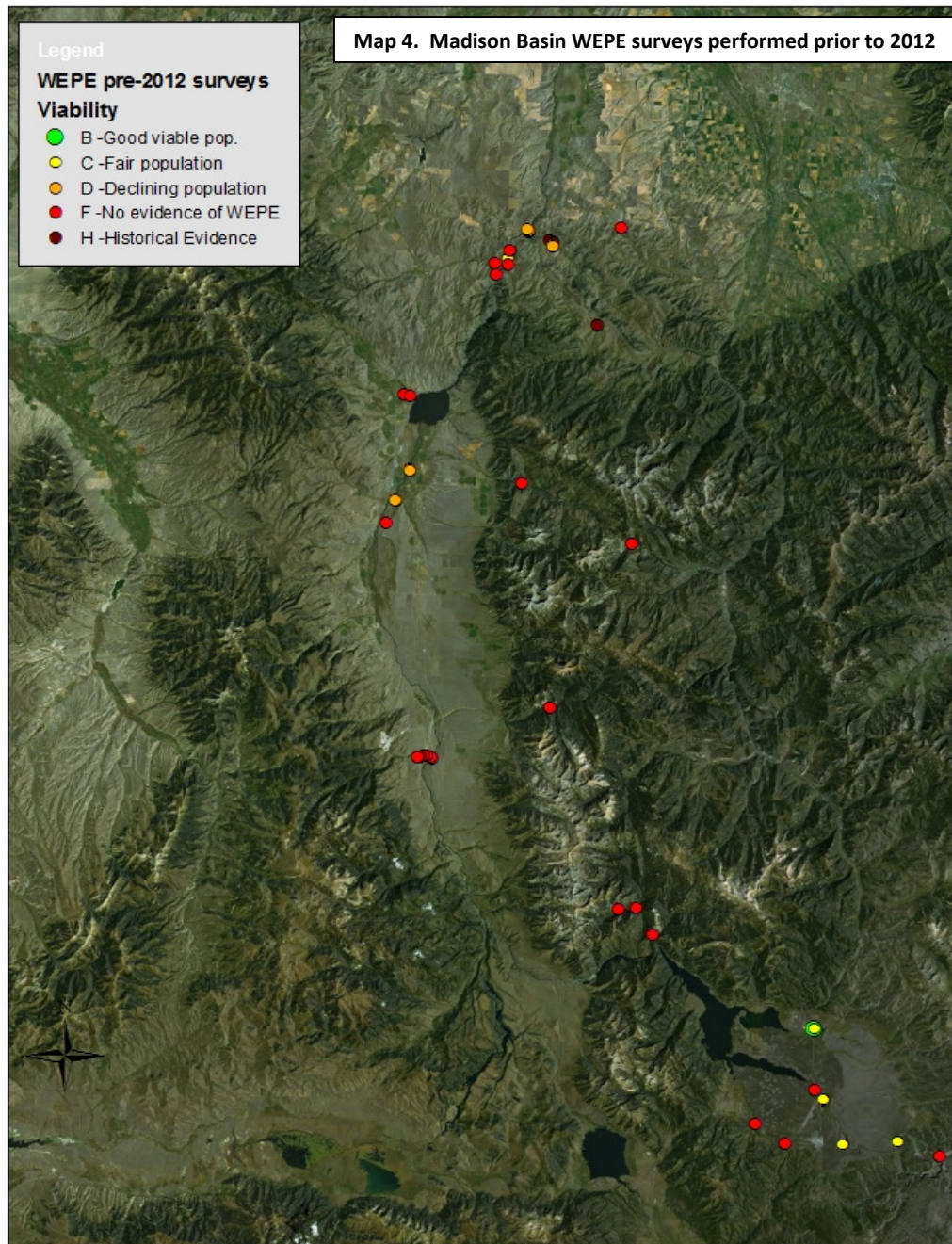
Map 2. Cherry Creek continued from Map 1 (site 820) downstream thru Butler Reach to the canyon (Site 832)



We surveyed 25 previously unvisited stream reaches in 11 streams within the Madison and Jefferson River Basins during the summer of 2012 trying to locate a donor WEPE population (Map 3). Despite considerable survey effort, we did not find a single live WEPE mussel. We identified recently dead WEPE shells in a new reach of O'Dell Spring Creek indicating the



potential of a live population (D-rank viability), but the two other streams containing WEPE shells, the Ruby and Jefferson Rivers, only had relic shells (>10 years old) and are not likely to contain live populations. Of fifty-one stream reaches in the Madison River basin that had been surveyed for WEPE prior to 2012 (Appendix B), only one of those reaches was ranked as having a viable WEPE population (Duck Creek, B-rank)(Map 4). We did not return to Duck Creek in 2012 to collect mussels for the fish health screening, but plan to revisit this site in 2013 to



evaluate Whirling Disease Status with a backpack shocking grab sample of rainbow trout and a WEPE collection to submit for health screen analysis as required for translocation (FWP 2010). Previous whirling disease testing on 136 total trout from Duck Creek in 2004, 2005 and 2007 showed 0% infected, except for 1 outlier in 2007 (1 out of 43 infected at a Grade 5)(P. Clancy, pers. comm.). Pat said “When they got a real outlier like this they attributed it to a fish getting mixed into the wrong aquarium at Pony (they had occasional problems with jumpers), a mix up in processing prior to sending to the lab, or a mix-up at the lab.” Thus, Duck Creek could be considered WD- and our Madison River basin donor WEPE population with an additional WD negative trout sample and a clean Fish Health Mussel Screen in 2013.

Conclusion

Completion of extensive habitat analysis within the Cherry Creek Native Trout Project Reach, allows us to have the scientific evidence along with our professional opinion to confidently determine that at least five reaches of Cherry Creek on the Turner Flying D Ranch contain the preferred stream habitat, as well as suitable densities of their native host fish (WSCT) capable for allowing the western pearlshell mussel to survive, reproduce, and persist once translocated to this stream. As evidenced by our 2012 and previous surveys, WEPE populations are in decline throughout the Madison River basin and another secure (viable) population in Cherry Creek would considerably aid conservation efforts for this species.

Literature Cited

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Appendix A. Riffle Substrate Pebble Data (100 count) taken during the Wollman Pebble Count

Reach ID	Pebble Count (bkf width m)	Riffle Pebble Count D50	<2mm	2-4 mm	4.1-5.7 mm	5.7-8 mm	8-11.3 mm	11.4-16 mm	16-22.6 mm	22.6-32 mm	32-45 mm	45-64 mm	64-90 mm	90-128 mm	>128mm
116	6.8	90-128	6	4	3	3	2	2	6	7	10	10	17	15	15
119	6.8	45-64	14	5	2	2	3	3	7	8	17	9	13	7	10
819	7.0	64-90	9	8	4	5	6	5	2	6	9	11	8	11	16
821	9.6	64-90	9	8	4	5	6	5	2	6	9	11	8	11	16
823	11.0	32-45	18	3	4	2	2	3	9	13	20	17	5	2	2
825	6.7	90-128	6	8	4	5	6	5	2	6	9	11	8	14	16
826	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
827	9.0	90-128	6	7	2	5	5	2	6	9	5	8	9	9	27
829	9.8	90-128	6	7	2	5	5	2	6	8	5	8	9	12	25
830	10.1	64-90	8	8	4	1	3	4	4	3	10	16	9	18	12
831	10.1	64-90	8	8	4	1	3	4	4	3	10	16	9	18	12
832	10.1	90-128	6	4	4	1	3	4	4	3	7	10	17	15	22
833	10.2	45-60	8	7	7	4	1	5	4	7	11	17	9	10	10
834	10.2	45-60	8	7	7	4	1	5	4	7	11	17	9	10	10

Appendix B. WEPE Surveys performed in the Madison River Basin prior to 2012. Viability Code: B-good viability, C -fair population, D –declining, not viable, F- absent, failed to find evidence of a population, H-Historical Verified Site, population now absent)

Stream	Latitude	Longitude	Mussel_species	Viability	Observation Date
Cabin Creek	44.87640	-111.34560	No Mussels Found	F	29-Jul-07
Cherry Creek	45.61977	-111.54643	No Mussels Found	F	14-Jul-08
Cherry Creek	45.62191	-111.54842	Margaritifera falcata	D	15-Jul-08
Cherry Creek	45.62143	-111.54659	Margaritifera falcata	D	15-Jul-08
Cherry Creek	45.62285	-111.54975	Margaritifera falcata	D	15-Jul-08
Cherry Creek	45.61252	-111.51614	Margaritifera falcata shells , no live	H	26-Aug-10
Cherry Creek	45.61051	-111.51238	Margaritifera falcata shells , no live	H	26-Aug-10
Cherry Creek	45.60902	-111.51261	Margaritifera falcata shells , no live	H	26-Aug-10
Cherry Creek	45.60630	-111.51176	Margaritifera falcata	D	26-Aug-10
Cherry Creek	45.52255	-111.44596	No Mussels Found	H	26-Aug-10
Cougar Creek	44.71508	-111.11069	No Mussels Found	F	31-Jul-07
Duck Creek	44.77958	-111.11499	Margaritifera falcata	C	31-Jul-07
Duck Creek	44.77998	-111.11357	No Mussels Found	F	31-Jul-07
Duck Creek	44.77956	-111.11249	Margaritifera falcata	B	16-Jul-08
Elk Creek	45.62670	-111.41430	No Mussels Found	F	15-Jul-07
Fourmile Creek	45.34124	-110.23215	No Mussels Found	F	15-Jul-07
Hot Springs Creek	45.58564	-111.59409	No Mussels Found	F	15-Jul-08
Jack Creek	45.35338	-111.54909	No Mussels Found	F	15-Jul-07
Madison River	44.64702	-110.93216	No Mussels Found	F	31-Jul-07
Madison River	44.66194	-110.99187	Margaritifera falcata	C	31-Jul-07
Madison River	44.70339	-111.09805	Margaritifera falcata	C	31-Jul-07
Madison River	44.70484	-111.09695	Margaritifera falcata	C	31-Jul-07
Madison River	44.65740	-111.06970	Margaritifera falcata	C	31-Jul-07
Madison River	44.77988	-111.11298	Margaritifera falcata	C	16-Jul-08
Madison River	45.59050	-111.57620	Margaritifera falcata	C	13-Jul-02
Madison River	45.58510	-111.57629	No Mussels Found	F	15-Jul-08
Madison River	45.57462	-111.59357	No Mussels Found	F	16-Jul-08
Madison River side channel	45.59978	-111.57332	No Mussels Found	F	15-Jul-08
Meadow Creek	45.44380	-111.71891	No Mussels Found	F	15-Jul-08

Meadow Creek	45.44259	-111.71032	No Mussels Found	F	15-Jul-08
Middle Fork of West Fork	45.29219	-111.38807	No Mussels Found	F	07-Aug-07
No Man Creek	45.11550	-111.49810	No Mussels Found	F	17-Aug-05
North Fork Meadow Creek	45.65757	-111.89389	No Mussels Found	F	14-Jul-08
O'dell Creek	45.36590	-111.70720	No Mussels Found	F	02-Aug-11
O'dell Creek	45.36514	-111.70708	Margaritifera falcata	D	02-Aug-11
O'dell Creek	45.36378	-111.70731	Margaritifera falcata	D	02-Aug-11
O'dell Creek	45.33248	-111.72650	Margaritifera falcata	D	02-Aug-11
O'dell Creek	45.33113	-111.72831	Margaritifera falcata	D	02-Aug-11
O'dell Spring Creek	45.30711	-111.73920	No Mussels Found	F	15-Jul-07
Ruby Creek	45.05903	-111.66366	No Mussels Found	F	01-Aug-11
Ruby Creek	45.05957	-111.66560	No Mussels Found	F	01-Aug-11
Ruby Creek	45.06073	-111.67164	No Mussels Found	F	01-Aug-11
Ruby Creek	45.06114	-111.67307	No Mussels Found	F	01-Aug-11
Ruby Creek	45.06183	-111.67633	No Mussels Found	F	02-Aug-11
Ruby Creek	45.06051	-111.68027	No Mussels Found	F	02-Aug-11
Ruby Creek	45.06013	-111.68352	No Mussels Found	F	02-Aug-11
Ruby Creek	45.06020	-111.68547	No Mussels Found	F	02-Aug-11
South Fork Madison River	44.65752	-111.15062	No Mussels Found	F	31-Jul-07
South Fork Madison River	44.67870	-111.19432	No Mussels Found	F	31-Jul-07
West Fork Beaver Creek	44.90506	-111.36955	No Mussels Found	F	29-Jul-07
West Fork Beaver Creek trib	44.90346	-111.39455	No Mussels Found	F	29-Jul-07